

TRAINING MATERIAL

Title:

The use of **solid manure**

Training:

Main features of the subcategory

Solid manure is a soil improver with a high dry matter percentage. Livestock manure is a mixture of feces and urine, bedding material (e.g. straw, wood shavings, sawdust, sphagnum), spilt feed and drinking water, and water used for washing floors. It is a valuable fertilizer that contains a broad range of nutrients such as nitrogen (N), phosphorus (P) and potassium (K) as well as organic carbon which can be utilised by soil microorganisms. Raw manure can be processed with separation technologies that produce a solid fraction in which much of the P and dry matter (DM) and significant amounts of the N are retained. There are several technologies available for liquid and solid separation, including in-house separation such as slatted floors with cellars or channels beneath, natural sedimentation, drying, evaporation, centrifugation, pressurized separation such as screw or belt press. To increase the separation efficiency, manure can be pretreated by using additives such as brown coal, bentonite, zeolite, crystals, chitosan and efficient microorganisms. Depending on the pre-treatment and separation technologies, the obtained solid manure may contain up to 90% of organic matter with reduced volume, which results in reduced storage and transportation cost as well as reduced odors and GHG emission. Therefore, solid manure represents high potential to be used as organic fertiliser or soil amendment. It can be used for several types of crops.

Input material

Livestock manure (poultry, pig, cattle, calves)

How to produce?

Solid manure can be produced in several ways depending on which technology is being used.

Solid manure coming from the Geamix system (ID 595) is produced by separation at source of solid manure and urine. The calves stay on a steel slatted coated floor. The manure falls through the slatted floor on a perforated, urine permeable manure belt that lies under the grid floor. The urine falls completely through the perforated manure belt. Another example of separation at the source of manure is the VeDoWS system in pig housing (ID 323). Underneath the slatted floor of the VeDoWS stable system a shallow cellar is constructed which enables the primary separation of urine and solid manure. The cellar consists of two inclining parts with in its middle an opening of 18 to 22 mm. Using a scraper, the solid manure is removed from the manure gutter daily. This primary separation of manure in the cellar is the basis of lower ammonia emissions.

Solid manure coming from a belt press sieve and pasteurization (ID 594) is processed of slurry from 95% pigs and 5% cattle or mink. The slurry is separated in a solid and liquid fraction using a belt press sieve. The liquid fraction is being turned into mineral concentrate. The solid fraction is pasteurized by infrared and exported.

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Solid poultry manure can be obtained by collecting the poultry droppings on treadmills in the hen houses and bring them to a drying tunnel (ID 370). The transformed poultry droppings are brought with a conveying tunnel in storage to be mixed and homogenized. This process ensures the stabilization of the organic matter by eliminating the free water, with decrease of the odors, conservation of the product by stop of the fermentation and concentration of nutrients.

Typical nutrient content and availability for plants

The nutrient content is strongly dependent on the used technology and input material. In the case of the Geamix system (ID 595), the nutrient content is 13 g/kg N, 9,4 g/kg P_2O_5 and 8,2 g/kg K_2O . In the case of using a belt press sieve for the separation of mostly pig slurry (ID 594), the nutrient content is 13 g/kg N, 18,0 g/kg P_2O_5 and 5,1 g/kg K_2O . In the case of the SECONOV dehydration process (ID 370), the nutrient content is 4,6% N, 3% P and 2,9% K.

Examples of solid manure products available on the NUTRIMAN Farmer Platform

- https://nutriman.net/farmer-platform/product/id_370 (France)
- https://nutriman.net/farmer-platform/product/id_594 (The Netherlands)
- https://nutriman.net/farmer-platform/product/id_595 (The Netherlands)



Figure 1. solid poultry manure (ID:370). Figure 2. Solid pig/cattle slurry (ID:594). Figure 3. Solid calves manure (ID:595)

Fields of application in agriculture: crop, dosages, application method and practical recommendations.

Solid manure can be used for a wide range of applications as soil improver. For instance, the NPK organic fertilizer from poultry droppings with SECONOV dehydration process (ID 370) can be used for wheat, barley, corn, rape, sunflower, potatoes, fruit trees, grapes, ..., with a typical application dose of 1 to 4 t/ha. The dosage depends on crop application rates, but is currently limited to 170 kg N/ha as livestock manure or 230-250 kg N/ha for derogation farms in NL.

Solid manure can be applied before sowing or planting of the crops with the same machines which are now being used for spreading solid manure.

Benefits for farmers

Solid manure is a natural product with a high organic matter content. Therefore, the C/N ratio is high which means that these products are well-stabilized but able to increase soil fertility. Depending on the used technology and input material, some additional benefits can be seen (e.g. organic phosphorus with high bioavailability, hygienic and free from pathogens).

Bottlenecks of application. Potential risk or limitation.

It is necessary to choose the application dosage according to soil availability and crop uptakes. Also, under the current regulations, the solid manure is treated as livestock manure and need to follow the limit of max 170 kg total N per hectare (230-250 kg N/ha for derogation farms in NL).

Legal framework for usingSpecific national legal conditions

ID 370 respect the French standard NF U42-001.

ID 594 respects the Dutch standard NL-219144.

EU Fertilising Products Regulation

As suggested in the European Commission's "end-of-waste criteria", recovered materials like manure can be re-classified as products (i.e. as non-waste), thus can fit in the EU fertilising products regulation No. 2019/1009 as PFC 1 (A) organic fertiliser or PFC 3 (A) organic soil improver.

Economic evaluation of the application of the products

The NPK organic fertilizer from poultry droppings with SECONOV dyhydration process (ID 370) has an average cost of about 125 €/ha. The organic soil improver from calves manure by Geamix separation at source costs about 30 €/ton (ID 595), so the price per ha will be dependent on the dose applied. When looking at the solid fraction from pig/cattle slurry using belt press sieve and pasteurization (ID 594), the price is even negative (-15 €/ton) since the producer needs to pay to be able to deliver the product.

Best management practice guideline, taking into account of specific conditions of the given territory, for the use of the product to the specific applications (soil improvers, growing media, organic fertilisers etc.).

The application doses of the poultry droppings (ID 370 is dependent to the harvest objectives, but is generally between 1 to 4 ton/ha.

The application rates of the solid manure of ID 594 and Id 595 depends on the crop application rates. Currently max 170 kg N/ha as livestock manure (230-250 kg N/ha for derogation farms in NL).

How to store, apply to land, machinery needs.

Solid manure should be stored in dry place. The simplest method of storage is on the ground covered with a tarp or plastic sheet, which will prevent excess moisture. Solid manure can be applied before sowing or planting of the crops with the same machines which are now being used for spreading solid manure.

For more information:

- https://nutriman.net/farmer-platform/product/id_370 (France)
- https://nutriman.net/farmer-platform/product/id_594 (The Netherlands)
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